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# Invasion of nitrite oxidizer dominated communities: interactions between propagule pressure and community composition

*Marta Kinnunen, Arnaud Dechesne, Hans-Jørgen Albrechtsen, Barth F. Smets*

Managing invasion of microbial communities by new members can be a powerful tool in microbial resource management. Abundant studies have examined how resource availability and resident community diversity affect invasion success. Yet, a more rigorous approach towards studying invasion would consider a broader community ecology framework. For example, the effect of propagule pressure, often studied in macro-ecology, has rarely been examined for microbial communities. Also, the interactions between processes governing community assembly and propagule pressure on invasion success have never been reported.

The objective of this study was to determine the effect of propagule pressure on invasion success in microbial communities, shaped by varying degrees of stochasticity and determinism.

The experimental system consisted of nitrite oxidizing bacterial enrichments, developed in replicate flow-through biofilm reactors using drinking water as inoculum and continuous feeding with nitrite a sole energy source. Different nitrite loading rates were applied, as these were previously shown to influence nitrifying guild composition and stochasticity [1]. After 6 weeks, the reactors were invaded for 24 hours by nitrite oxidizer strain (*Candidatus* Nitrotoga sp. HW29) at 3 different propagule pressures. The reactors were then operated another 2 weeks before analyzing community composition by targeted qPCRs and 16S rRNA gene amplicon analysis.

We successfully assembled resident communities with different ratios of *Nitrotoga* to *Nitrospira* as a result of determinism created by different nitrite concentrations: High nitrite loading selected for a diverse and abundant *Nitrotoga* population while low nitrite loading selected for an abundant *Nitrospira* population. We noted invasion success only at the highest propagule pressure, and the frequency of establishment was higher under low versus high nitrite loading conditions. Contrary to previous invasion studies, we found no significant correlation between resident community diversity and invasion success. Instead, our results suggest that deterministic processes combined with resident-invader phylogenetic relatedness influence invasion success.

1. KINNUNEN, Marta, GÜLAY, Arda, ALBRECHTSEN, Hans-Jørgen, DECHESNE, Arnaud and SMETS, Barth F. Nitrotoga is selected over Nitrospira in newly assembled biofilm communities from a tap water source community at increased nitrite loading. *Environmental Microbiology* [online]. 10 May 2017.DOI 10.1111/1462-2920.13792